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The Impact of Minimum Wage Increases in Japan: An analysis after the introduction of numerical targets*

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Abstract

This study examines the impacts of recent minimum wage increases on businesses using panel data on Japanese firms. The gap between neighboring prefectures' minimum wages is used as an instrument for prefectural minimum wage increases. The results shows that, first, prefectural minimum wage increases raised average wages for firms located in the prefecture but reduced employment. Second, minimum wage increases lowered firms' profit margins. Third, no evidence is found showing that minimum wage increases improved firm productivity. Therefore, minimum wages may adversely affect the concerned regions unintentionally when they are not set at levels reflecting regional difference in productivity.

Keywords: minimum wages, profit margins, labor productivity, total factor productivity, regional economy
JEL Classification: D24, J31, R12

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1. Introduction

Minimum wage increases have been actively implemented in Japan since 2007, when the Minimum Wage Act was amended to address the issue of the minimum wage falling below welfare benefits. Between 2006 and 2025, the nationwide weighted-average minimum wage rose by 67%, from 673 to 1,121 yen. The stagnation of real wages has attracted attention after adjusting for consumer price inflation, whereas the minimum wage has risen significantly in real terms. During this period, the average real wage of general workers fell by 2.7% (an annual rate of −0.1%), whereas the real minimum wage rose by 37% (an annual rate of +1.7%).[1]

The Action Plan for Work-Style Reform (March 2017) aimed to raise the nationwide weighted-average minimum wage to 1,000 yen, which was achieved in 2023. In response, the Basic Policy on Economic and Fiscal Management and Reform (hereafter, the Basic Policy) for 2024 set a new target of raising the nationwide weighted average to 1,500 yen by the mid-2030s. The Ishiba Cabinet's Basic Policy 2025 significantly brought forward the target date, aiming to achieve 1,500 yen in the 2020s. Achieving this target by 2029 would require an unprecedented annual increase of 7.6%. The Takaichi Cabinet's Basic Policy 2026 extended the target timeline to "achieve a national average of 1,500 yen as early as possible, no later than the early 2030s." Although this target is more realistic, achieving it by 2034 would still require continuous annual increases at a rate comparable to the average over the past decade for nearly another decade (see **Figure 1**).

The above reflects trends in the nationwide weighted average. However, since the mid-2010s, prefectures with lower minimum wages have tended to increase at higher rates, resulting in a narrowing of regional disparities in minimum wages. **Figure 2** plots (1) the ratio of maximum to minimum and (2) the coefficient of variation (the standard deviation divided by the mean) of prefectural minimum wages.[2] Minimum wage increases were most pronounced in major

[1] Average wages are based on general (full-time) workers' data from the Basic Survey on Wage Structure (Ministry of Health, Labour and Welfare), and real wages are calculated using the consumer price index (excluding imputed rent) published by the Statistical Bureau of Japan.

[2] The average figures used in the calculation are the simple average of the prefectural minimum wages.

metropolitan areas until 2014 when efforts were made to eliminate the reversal between minimum wages and welfare benefits. However, in recent years, the increase rate has been higher in rural areas. Over the past 10 years, until 2025, Tokyo's minimum wage has increased by 35%, compared with approximately 50% in several prefectures in the Tohoku, Shikoku, and Kyushu regions. This difference reflects the central government's policy of narrowing regional minimum wage disparities. Regarding the government's policy on raising the minimum wage, the Basic Policy 2019 stated that it would take "interregional disparities into account," and the Basic Policy 2023 explicitly stated the goal of reducing regional disparities by "raising the ratio of the lowest regional minimum wage to the highest." This wording has been maintained through the Basic Policy 2026.

However, specific minimum wage increase policies vary across prefectures. Recently, some prefectures have begun implementing substantial minimum wage increases that exceed the guideline set by the Central Minimum Wage Council. Since 2018, several prefectures have implemented increases of 2 yen or more above the guideline. In 2024, Tokushima Prefecture implemented an increase of 84 yen—33 yen above the national weighted-average increase, known as the "Tokushima Shock." In 2025, 11 prefectures implemented increases of 10 yen or more above the guideline. Particularly, Akita Prefecture substantially raised its minimum wage by 80 yen. This trend is driven by competition with neighboring prefectures and the desire to avoid having the lowest minimum wage.[3]

Regional wage disparities reflect productivity and price level differences; thus, eliminating regional minimum wage disparities only is unrealistic. In 2025, the prefectural minimum wage elasticity with respect to prefectural population density was 0.036, much lower than that of the average hourly wage of general workers (0.076). Therefore, the minimum wage may deviate from the spatial equilibrium. Rural prefectures are proactive in raising the minimum wage to curb the outflow of labor to prefectures with higher minimum wages. However, excessive increases could negatively affect labor demand by firms located in those regions. Several studies in the United States have shown that low-wage workers migrate to regions with lower minimum wages (e.g., Martin and Termos, 2015; Monras, 2019). Data on Japanese firms also show that firms relocate from high- to low-minimum wage regions (Morikawa, 2022).

As surveyed in the next section, the topic of minimum wage effects has gained the interest of

[3] See document presented in the Central Minimum Wage Council dated June 23, 2026.

economics researchers worldwide, and numerous empirical studies have been conducted on this subject. Since Card and Krueger (1994), minimum wage research has focused primarily on its employment impacts, and numerous studies have been conducted worldwide. Contrary to predictions from a perfectly competitive labor market, many studies found either no negative employment impact or that any negative impact is small in magnitude or limited to specific groups of workers, such as teenagers. Accordingly, the focus of research has broadened to include effects beyond employment, revealing that adjustments occur along various margins, such as corporate profit reductions, non-wage labor cost reduction, productivity improvements, and cost pass-through to product and service prices (see Clemens, 2021; Dube and Lindner, 2024, for recent representative surveys).

A survey of Japanese firms also revealed that firms respond to minimum wage increases along various margins (see **Appendix Table A1**), including, in order, (1) raising prices (47.7%), (2) reducing profits (38.8%), and (3) improving productivity through equipment investments (34.5%). These responses are far more common than labor input adjustments, such as reducing the number of employees (7.1%) and cutting working hours (27.5%).

Therefore, to fully evaluate the economic effects of the minimum wage, analyses considering various outcomes must be conducted, rather than focusing on employment only. For example, Morikawa (2022) analyzed the minimum wage effects on labor productivity, total factor productivity (TFP), return on assets (ROA), and other variables using panel data on Japanese firms (fiscal year (FY) 2001–2018). The results indicated that although the minimum wage had no statistically significant effect on productivity, a negative effect on profitability was found.

To address the endogeneity of minimum wages set by prefectures, his study follows Kawaguchi and Mori's (2021) approach. He treated the elimination of minimum wages below the welfare benefit level as an exogenous policy shock and conducted estimations using the gap between the minimum wage and the welfare benefit level as an instrument.[4] However, because minimum wages below the welfare benefit level had been eliminated by 2014, subsequent years are outside the scope of the estimations. Since the release of the Action Plan for Work-Style Reform in 2017, the government has set medium-term minimum wage targets. Given these policy developments and macroeconomic environmental changes, such as rising inflation, an analysis covering a recent

[4] Okudaira *et al*. (2019) also focused on the elimination of minimum wages below welfare benefit levels and conducted an estimation using the guidelines for prefectural minimum wages set by the Central Minimum Wage Council as an instrument.

period is necessary.

This study analyzes the effects of minimum wage increases since 2017 on wages, employment, profit margins, and productivity (labor productivity and TFP). The analysis uses firm-level panel data from the Basic Survey of Japanese Business Structure and Activities (BSJBSA), conducted by the Ministry of Economy, Trade and Industry through FY 2023. To address the endogeneity of prefectural minimum wages, we use the gap between a prefecture's minimum wage and those of its neighboring prefectures as an instrument for the minimum wage increase. This approach is based on the conscious effort of recent revisions to prefectural minimum wages to set minimum wages at levels that are competitive with those of neighboring prefectures, i.e., a "minimum wage increase race."

According to the estimation results, first, although minimum wage increases raised the average wages of firms located in the relevant prefectures, they reduced employment. Second, minimum wage increases lowered firms' profit margins. Third, no evidence was found that minimum wage increases boosted firms' productivity.

Section 2 below briefly surveys previous studies on adjustments along various margins in response to minimum wage increases. Section 3 explains the data and estimation methods employed in this study. Section 4 reports the estimation results, and Section 5 summarizes the conclusions and discusses the limitations of the analysis.

2. Literature review

Many studies have examined the employment impact of minimum wages. Although no consensus has been reached, many studies find either no negative effects or, if any, quantitatively small effects and limited to specific groups, such as young workers and food service and retail workers (see Dube and Lindner, 2024, for a recent survey).

Because Japan's minimum wage is set at the prefectural level, studies have examined its employment impact by exploiting these geographical variations (e.g., Kambayashi *et al*., 2013; Okudaira *et al*., 2019; Kawaguchi and Mori, 2021; Kanayama *et al*., 2026). Kambayashi *et al*. (2013) conducted an analysis covering 1994–2003 using data from the Basic Survey on Wage Structure and the Employment Status Survey. They concluded that although minimum wage increases reduce wage inequality among female workers at the lower end of the wage distribution,

they also negatively impact their employment opportunities. Okudaira *et al*. (2019) analyzed manufacturing plants using 2008–2014 data from the Census of Manufacturers and the Basic Survey on Wage Structure. They found heterogeneous impacts of minimum wage increases on employment across plants and that plants with a smaller gap between productivity (the marginal product of labor) and wages experienced a greater negative employment impact. Kawaguchi and Mori (2021) analyzed data from the Basic Survey on Wage Structure and Labor Force Survey, exploiting the natural experiment arising from the elimination of minimum wages below welfare benefit levels following the 2007 Minimum Wage Act amendment. They found that although minimum wage increases raised wages for low-wage workers, they also had a significant negative impact on the employment of young male workers with low education levels. Kanayama *et al*. (2026) uniquely examined 2023–2024 job posting and contract data for gig work and reported that a minimum wage increase led to a decline in job postings for low-wage occupations, such as food service, retail, and event staff. Overall, many recent studies in Japan found that minimum wage increases negatively impacted employment.[5] This finding may be related to the situation in which Japanese firms had little room for high labor cost pass-through to prices of their products and services amid persistent mild deflation. Based on an analysis of Japanese manufacturing firms, Yamanouchi *et al*. (2025) reported that, in a low-inflation environment, no clear pass-through of minimum wage increases to product prices was observed.

A growing body of studies indicates that the limited employment impact stems from firms offsetting labor cost increases arising from minimum wage increases through adjustments along various margins other than employment. Specifically, these margins include (1) profit reductions (e.g., Draca *et al*., 2011; Hirsch *et al*., 2015; Bell and Machin, 2018; Drucker *et al*., 2021; Morikawa, 2022); (2) passing on the costs to consumers through increased prices for products and services (e.g., Aaronson *et al*., 2008; Wadsworth, 2010; Hirsch *et al*., 2015; MaCurdy, 2015; Aaronson *et al*., 2018; Allegretto and Reich, 2018; Harasztosi and Lindner, 2019; Leung, 2021; Ashenfelter and Jurajda, 2022; Renkin *et al*., 2022; Calderón *et al*., 2023; Esposito *et al*., 2024; Kunaschk, 2024; Link, 2024; Ruffini, 2024); (3) non-wage labor cost reductions, such as training and education expenses and employee benefits (e.g., Hara, 2017; Clemens *et al*., 2018; Kim *et al*., 2023; Zhao and Grignon, 2026); and (4) absorption through productivity improvements (e.g.,

[5] In addition to the employment impact, Mori and Okudaira (2025) showed that the minimum wage negatively impacted working hours.

Georgiadis, 2013; Riley and Bondibene, 2017; Mayneris *et al*., 2018; Hau *et al*., 2020; Rao and Risch, 2026).

As this present study focuses on the impact on productivity, studies on the productivity effects of the minimum wage must be reviewed comprehensively. Draca *et al*. (2011) examined the introduction of the minimum wage in the United Kingdom in 1999 and found that the minimum wage reduced firm profitability but did not affect productivity. In contrast, Riley and Bondibene (2017) presented evidence that productivity increased among UK firms employing low-wage workers. Georgiadis (2013) also analyzed the effects of the UK minimum wage on homecare workers and reported results showing that the wage increase functioned as an "efficiency wage" and boosted productivity. Mayneris *et al*. (2018) examined minimum wage increases in China and found that firms absorbed increased wage costs through productivity improvements, resulting in limited job losses without adversely affecting profitability. Hau *et al*. (2020) also focused on China and similarly found that productivity increased, except for state-owned enterprises. Rao and Risch (2026) examined the US minimum wage and found that firms in industries with high exposure to the minimum wage, such as food service, did not experience an employment decline because of labor productivity increases through new revenue growth and worker reallocation to more productive firms. Ku (2021) and Coviello *et al*. (2022) provided evidence that minimum wage increases also boost worker-level productivity.

Studies analyzing the effects on Japanese firm productivity include Morikawa (2022) and Fukao *et al*. (2026). Morikawa (2022) conducted fixed-effects and instrumental variable estimations using panel data from the BSJBSA for FY 2001–2018 and concluded that no evidence was detected that past minimum wage increases boosted firm productivity. Based on an analysis using panel data from the Economic Census for Business Activity for 2012, 2016, and 2021, Fukao *et al*. (2026) concluded that evidence on the statistically significant positive effect of minimum wage increases on labor productivity or TFP was limited.

The abovementioned studies focus on the effects on individual firm productivity ("within effects"). However, a minimum wage increase may also boost aggregate industry-level productivity through the downsizing or exit of firms and establishments that cannot cope with rising wage costs ("reallocation effects"), although an analysis of such reallocation effects is beyond the scope of this study. Dustmann *et al*. (2022) and Rao and Risch (2026) showed that market shares and workers were reallocated to productive firms. Many studies have analyzed the impact of minimum wage increases on business closures and market exit. Several studies found

that exit rates increased (e.g., Aaronson *et al*., 2018; Chava *et al*., 2023; Lee and Park, 2026), whereas others found no such effect (e.g., Machin and Wilson, 2004; Draca *et al*., 2011). In Japan, Fukao *et al.* (2026) reported that the results were different depending on the period analyzed.

In addition, several studies indicate capital substitution for labor, such as through the adoption of automation technologies. This mechanism is likely to increase labor productivity, though it may negatively impact employment. Studies by Fan *et al*. (2021) on China and Brynjolfsson *et al*. (2026) on the United States showed that minimum wage increases raised the probability of robot adoption. The development and adoption of automation technologies, such as artificial intelligence (AI) and service robots, have progressed rapidly. Thus, although we do not address this issue in this study, considerable scope is available to future research on the effects of minimum wages on the adoption of new automation technologies.

This study analyzes the impact of minimum wage increases in Japan by focusing on firms' responses along multiple dimensions, including employment reductions, profit compression, and productivity improvements.[6] The contribution of this study lies in its focus on the unique situation in which local governments race to raise minimum wages under the prefectural minimum wage system and in its estimation method that accounts for the endogeneity of minimum wage determination.

3. Data and analysis method

This study uses firm-level panel data from the BSJBSA for FY 2018–2023. The BSJBSA is a fundamental annual statistical survey of Japanese firms and is frequently used in empirical productivity studies. The survey covers all firms with at least 50 regular employees, a capital of at least 30 million yen, and owing business establishments in the mining, manufacturing, wholesale, retail, restaurant, and specific service industries; the annual sample size is approximately 30,000 firms.[7] A panel dataset was easily constructed because each firm is assigned a permanent identification number. From these data, we calculated firm-level average

[6] However, the price pass-through and productivity effects of resource reallocation are outside the scope of this study.

[7] Since FY 2021, the BSJBSA has been conducted using the same list of firms as the Annual Business Survey (Ministry of Internal Affairs and Communications and Ministry of Economy, Trade and Industry), resulting in an increase in the sample size to approximately 35,000 firms.

wages, ROA, labor productivity, and TFP. However, because extremely large and small values existed, we removed observations that fell outside the range of ±3 standard deviations from the mean of each variable as outliers and then used the year-over-year change in each variable as the dependent variable.

We constructed a dataset by linking these firm-level panel data with annual minimum wage data by prefecture and used the year-over-year change in the log minimum wage (*ΔMW*) as the explanatory variable. The BSJBSA includes many firms with establishments located in multiple prefectures. We used only firms with a single establishment because the explanatory variable is the prefecture-level minimum wage. Single-establishment firms account for approximately 19% of all firms in the BSJBSA. **Appendix Table A2** compares the mean values of key firm characteristics (mean wages, number of employees, ROA, labor productivity, and TFP) between single- and multi-establishment firms. Single-establishment firms are relatively small in terms of the number of regular employees and have lower average wages, profit margins, and productivity, although the quantitative differences are small. Therefore, these firms are likely to be more susceptible to the effects of minimum wage increases than the overall sample of firms covered by the BSJBSA.

The dependent variables are the (1) mean wages of employees (*ΔWAGE*), (2) number of employees (*ΔEMP*), (3) profit margin (*ΔROA*), (4) labor productivity (*ΔLP*), and (5) TFP (*ΔTFP*), expressed as year-over-year changes. *ΔWAGE* is calculated by dividing total wages by total labor input (total hours), and *ΔEMP* refers to the number of regular employees, including part-time workers. Both variables are log-transformed for the analysis.[8] *ΔROA* is calculated by dividing operating income by total assets; *ΔROA* is the only dependent variable in this study that is not expressed in logarithmic form.[9]

ΔLP is calculated as the logarithm of value added per unit of labor input (total hours). Value added is the sum of operating profits, rental expenses, total wages, employee benefits, depreciation, and taxes paid. Labor input is calculated as the sum of the number of full-time employees multiplied by their average working hours and the number of part-time employees multiplied by their average working hours. However, because the BSJBSA does not include

[8] Until FY 2021, the number of employees in the BSJBSA was measured as of the end of March. Starting in FY 2022, it has been measured as of June 1. Therefore, the year-over-year change for FY 2022 reflects changes in one year and two months.

[9] This treatment is because ROA is often negative and results in missing values when log-transformed.

information on working hours, we used industry-level working hours for full-time workers and part-time workers from the Monthly Labor Survey (Ministry of Health, Labour and Welfare). To express value added in price-adjusted real terms, we used industry-specific value-added deflators from the National Accounts (Cabinet Office).

ΔTFP is measured non-parametrically for each three-digit industry using the index number approach. It is expressed relative to a "representative firm," defined as a firm for which cost shares and inputs and outputs are calculated as the arithmetic and geometric means for all firms in the industry, respectively. The TFP of an individual firm (expressed in logarithmic form) is measured as the deviation from that of the representative firm in the industry. Value added and labor input are the same as those used to measure labor productivity, as explained above, whereas capital input is measured using the book value of tangible fixed assets available from the BSJBSA. Labor costs include total wages and salaries plus employee benefits, whereas capital costs include the value of tangible fixed assets multiplied by the sum of the nationwide average interest rate on bank loans and the depreciation rate plus rental expenses. Price-adjusted real values are calculated using the industry-specific value-added and capital expenditure deflators from the National Accounts.

Prefectural minimum wages are typically set around October and remain in effect for one year. The firm-level data used in this study are fiscal-year figures. Thus, the minimum wages set in October of the previous year were matched to the data for the following fiscal year. Then, the logarithmic difference between the minimum wage and that of the previous year was used as an explanatory variable. Thus, this specification allowed for a six-month lag following the implementation of the minimum wage revision.[10]

Minimum wage determination by prefecture should be based on "due consideration for the cost of living and wages of workers in the region, as well as the ability of ordinary businesses to pay wages" (Article 9 of the Minimum Wage Act). Therefore, the endogeneity of minimum wages is necessary to address when analyzing their economic effects causally. Several previous studies have addressed this endogeneity by utilizing the 2007 amendment to the Minimum Wage Act, stipulating that "consistency with welfare benefit levels should be considered" to promote the elimination of minimum wages below welfare benefit levels. However, this approach cannot be

[10] Although this timeframe is outside the period of our analysis, the effective dates of the 2025 minimum wage revisions significantly varied, with Akita and Gunma Prefectures, for example, setting the effective date in March of the following year.

applied to the period after 2014 when the so-called "reversal phenomenon" was eliminated.

The Action Plan for Work-Style Reform (2017) aimed to raise the minimum wage at approximately 3% annually to achieve a nationwide weighted-average minimum wage of 1,000 yen. This target can be regarded as an exogenous shock to the minimum wage determination process in each prefecture. Thus, we conducted our analysis using minimum wage data from 2017 onward and the corresponding firm-level data from FY 2018 onward.

Gaps with neighboring prefectures influence the minimum wage determination in each prefecture. Thus, we conducted a 2SLS estimation using the gap (*MWGAP*) between the previous year's minimum wage in the prefecture in question and the average minimum wage of its neighboring prefectures as an instrument for minimum wage increases.[11] Although the previous year's *MWGAP* influences minimum wage setting in each prefecture, it is unlikely to directly impact firms within that prefecture. Minimum wages are log-transformed, and *MWGAP* is calculated as the prefecture's minimum wage minus the average minimum wage of its neighboring prefectures. Therefore, *MWGAP* is negative when the prefecture's minimum wage is lower than that of its neighbors and positive otherwise. If the minimum wage increase rate is larger when a prefecture's minimum wage is lower relative to those of neighboring prefectures, that is, if minimum wage adjustments are made to narrow the gap with neighboring prefectures, then the coefficient on *MWGAP* in the first-stage estimation will be negative. Firms in Hokkaido and Okinawa Prefecture are excluded from the sample for this estimation, because these two prefectures do not share borders with other prefectures.

In addition, we control for the trend in the dependent variable (y) for each firm over the previous three years ($\Delta y_{it-4,\,t-1}$), the year-over-year change in the unemployment rate for each prefecture ($\Delta UNEMP_{pt-1,\,t}$), and year fixed effects (λ_t).[12] The first- and second-stage estimation equations are expressed below (the subscripts p, i, and t denote the prefecture, firm, and year, respectively). **Table 1** presents summary statistics for the main variables.

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[11] Fukumura and Yamagishi (2020) theoretically demonstrated that local governments may compete in raising minimum wages. Fukao *et al*. (2026) conducted an estimation using the minimum wages of municipalities in neighboring prefectures that are within the commuting area of the municipality where the firm is located as an instrument.

[12] In the baseline estimations, the trend in the dependent variable over the previous three years is controlled following Morikawa (2022). However, alternatively, the trend over the previous five years is used to check the robustness.

$$\Delta MW_{pt-1,\,t} = \beta_0 + \beta_1 MWGAP_{pt-1} + \beta_2 \Delta y_{it-4,\,t-1} + \beta_3 \Delta UNEMP_{pt} + \lambda_t + v_{pt} \qquad (1)$$

$$\Delta Y_{it} = \alpha_0 + \alpha_1 \Delta MW_{pt-1,\,t} + \alpha_2 \Delta Y_{it-4,\,t-1} + \alpha_3 \Delta UNEMP_{pt} + \lambda_t + u_{it} \qquad (2)$$

As mentioned earlier, firm- and establishment-level empirical studies focusing on Japan's minimum wage have used the Census of Manufacturers and the Economic Census for Business Activity. The advantage of these surveys is that they cover small firms and establishments. However, the Census of Manufacturers is limited to the manufacturing sector and does not cover the service sector, which is likely to be strongly affected by minimum wage changes. The Economic Census for Business Activity covers the non-manufacturing sector, including small firms and establishments. However, it is conducted every five years and does not provide annual data. Therefore, it cannot capture the effects of year-to-year minimum wage changes. The advantage of the BSJBSA used in this study is that it provides annual data covering many industries; however, it does not include firms with fewer than 50 regular employees due to its size cutoff.

4. Results

Table 2 reports the baseline estimation results.[13] Standard errors, clustered by prefecture, are shown alongside the estimated coefficients. According to the first-stage estimates, the coefficient on *MWGAP* is negative and highly significant. Therefore, the lower a prefecture's minimum wage is relative to those of its neighbors, the greater the year-over-year increase in the minimum wage (*ΔMW*) tends to be.

In the estimation using *ΔWAGE* as the dependent variable (column (1)), the coefficient on *ΔMW* is positive and statistically significant. Firms' mean wages represent the average for all employees, not only low-wage workers near the minimum wage. Thus, the direct effect of a minimum wage increase is diluted. Nevertheless, the result indicates that the minimum wage raises mean wages. Quantitatively, a 1-standard-deviation larger increase in the minimum wage is associated with a

[13] When the trend over the previous five years is controlled, the results are essentially the same with the baseline estimations, except for the insignificant effect on *ΔWAGE* for one-year interval estimation.

1.8% increase (0.1 standard deviation) in the mean wage of firms located in the prefecture.

When ΔEMP is used as the dependent variable (column (2)), the coefficient on ΔMW is negative and statistically significant. Therefore, a minimum wage increase reduces employment at firms located in the prefecture. Quantitatively, a 1-standard-deviation larger increase in the minimum wage is associated with a 1.8% decrease (0.1 standard deviation) in the number of employees.[14] Because this effect is quantitatively comparable to that on mean wages, the impact on total employee compensation at individual firms is largely neutral. Morikawa (2022) used data through FY 2018 and found that although the minimum wage negatively impacted employment, it was not statistically significant. The significant negative effect in this study is different from the results of Morikawa (2022). This difference may be related to the minimum wage level relative to the average wages of general workers has risen and substantial minimum wage increases that have begun in rural areas.

The number of employees used here is the total number of standard employees (full-time workers) and non-standard employees (part-time workers). However, the coefficient on ΔMW is negative and highly significant, even when only the changes in the number of standard employees were considered (see **Appendix Table A3**).[15] The negative employment impact of minimum wage increases is not limited to non-standard employees.

Regarding changes in profit margins (ΔROA), the coefficient on ΔMW is negative and statistically significant (column (3)). Thus, minimum wage increases reduce the profits of firms located in the relevant prefectures. Quantitatively, a 1-standard-deviation minimum wage increase is associated with a 1.6-percentage-point decrease in ΔROA (0.3 standard deviations).

According to the estimates using ΔLP and ΔTFP as the dependent variables (columns (4) and (5)), the coefficients on ΔMW are negative but statistically insignificant. We did not find evidence

[14] The explanatory (ΔMW) and dependent variable (ΔEMP) are expressed in logarithmic form. Thus, the estimated coefficient represents the elasticity of employment with respect to the minimum wage. The estimated employment elasticity of approximately −1 is relatively large in absolute magnitude compared with those reported in previous studies.

[15] Due to a change in the BSJBSA's employee classification, the figures for FY 2022 and 2023 represent the number of employees under "permanent-term employment" rather than "standard full-time employees." The correlation coefficient between the number of full-time employees in FY 2021 and the number of permanent-term employees in FY 2022 (both expressed in logarithmic form) is approximately 0.97. Although this figure is slightly lower than in previous years (approximately 0.99), the difference is small. However, the correlation coefficient between the number of part-time employees in FY 2021 and the number of fixed-term employees in FY 2022 is approximately 0.87, which is lower than in previous years (0.93–0.96). Therefore, the impact of the change in survey classification is greater than that for standard employees.

that minimum wage increases boost firms' productivity.[16] These results are consistent with those reported by Morikawa (2022), which used data through FY 2018.

Considering that the effects of minimum wage changes may take time to materialize, **Table 3** presents the estimation results using two-year intervals for the explanatory ($\Delta MW_{t-1,\ t+1}$) and dependent variables ($\Delta y_{t-1,\ t+1}$). Although the coefficients have different magnitudes, the results showing that a minimum wage increase positively impacts mean wages, negatively impacts employment and profit margins, and does not significantly impact productivity are consistent with those from the baseline estimation using one-year intervals. However, the employment coefficient is larger in absolute magnitude than that for mean wages, implying a somewhat negative impact on firms' total employee compensation.

For comparison, **Appendix Table A4** presents the ordinary least squares (OLS) estimation results without using an instrument. In this case, ΔMW has a significant negative relationship with ΔEMP and ΔROA and no significant relationship with ΔLP and ΔTFP, as in the 2SLS estimates. The difference with the baseline estimation is that the relationship with $\Delta WAGE$ is positive but statistically insignificant.

The analysis period covered in this study includes the COVID-19 crisis. In the process of revising the minimum wage in 2020, the Central Minimum Wage Council recommended that "maintaining the current level would be appropriate." Subsequently, increases were implemented in 40 prefectures but were only minor adjustments of 3 yen or less. **Appendix Table A5** presents the 2SLS estimation results excluding the 2020 minimum wage revision.[17] In this case, the results showing significant negative effects of ΔMW on ΔROA and ΔEMP but no significant effects on ΔLP and ΔTFP are the same as those from the baseline estimation. However, although the coefficient on ΔMW for $\Delta WAGE$ remains positive, it is statistically insignificant.

5. Conclusion

Japan's minimum wage has been rising steadily and is expected to continue increasing toward a nationwide weighted average of 1,500 yen. Regional disparities in minimum wages have also

[16] Although not shown in the table, when the change in the capital-to-output ratio is used as the dependent variable, no significant effect of minimum wage increases is observed.
[17] In the estimation, observations for changes from FY 2020 to FY 2021 were excluded.

been narrowing since the late 2010s. This study analyzed the effects of minimum wage increases on wages, employment, profitability, and productivity using firm-level panel data. The analysis period covered 2017 onward, when the target of a nationwide weighted average of 1,000 yen was set. We utilized variations in minimum wage increases across prefectures and considered competition among prefectures to raise minimum wages for 2SLS estimation. The gap between a prefecture's minimum wage and those of its neighboring prefectures was used as an instrument for the prefecture's minimum wage increase.

The key findings are as follows. First, although minimum wage increases raised the mean wages of firms located in the relevant prefectures, they also led to an employment decrease. Second, minimum wage increases reduced firms' profit margins. Third, we did not find evidence that minimum wage increases boosted firms' productivity. Raising the minimum wage is a politically popular policy, but its impact on labor demand tends to be overlooked. The policy implication of this study is that minimum wage can have unintended negative effects on local economies if not set at an appropriate level, considering regional productivity differences. [18]

This study has several limitations. First, the firms analyzed here are limited to single-establishment firms with at least 50 regular employees. They do not include micro-enterprises, which are likely to be strongly affected by the minimum wage, or large firms with multiple establishments, which are less likely to be affected. Second, this study does not capture the impact on total employment in the region, because the analysis does not include employment reduction arising from business closures and employment creation through new businesses. Third, this analysis does not address the cost pass-through to consumers through price increases of products and services. This topic has attracted attention in recent minimum wage research. Since the early 2020s, as inflation has risen, price pass-through has become more common. Part of the cost of minimum wage increases may have been offset through this margin. Future research should examine this important topic.

[18] Since the analysis in this paper does not cover all firms in Japan, the employment decrease resulting from minimum wage increases may have been offset by an employment increase at firms not included in the sample (e.g., firms with multiple establishments and firms with fewer than 50 regular employees).

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Tables and Figures

Table 1. Summary statistics

Variable	Obs	Mean	Std. dev.	Min	Max
$\Delta WAGE$	30,311	0.013	0.214	-1.963	1.849
ΔEMP	31,124	-0.003	0.129	-3.394	4.157
ΔROA	30,439	-0.001	0.056	-0.468	0.466
ΔLP	24,430	-0.002	0.285	-2.322	2.899
ΔTFP	23,912	-0.007	0.290	-2.181	2.110
ΔMW	31,147	0.020	0.014	0.000	0.040
$MWGAP$	29,859	0.033	0.054	-0.121	0.111

Note: These numbers were calculated from single-establishment firms in the BSJBSA for FY 2018–2023. Observations that fall outside the range of ±3 standard deviations from the mean of each variable were removed as outliers.

Table 2. Baseline estimation results

	(1) $\Delta WAGE_{t-1,\,t}$	(2) $\Delta EMP_{t-1,\,t}$	(3) $\Delta ROA_{t-1,\,t}$	(4) $\Delta LP_{t-1,\,t}$	(5) $\Delta TFP_{t-1,\,t}$
$\Delta MW_{t-1,\,t}$	1.260 **	-1.287 ***	-1.128 ***	-0.241	-0.222
	(0.492)	(0.402)	(0.283)	(1.426)	(1.040)
Observations	24,065	24,406	24,149	18,923	18,552
R^2	0.124	0.003	0.130	0.113	0.150
First stage					
$MWGAP_{t-1}$	-0.024 ***	-0.024 ***	-0.024 ***	-0.023 ***	-0.023 ***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)

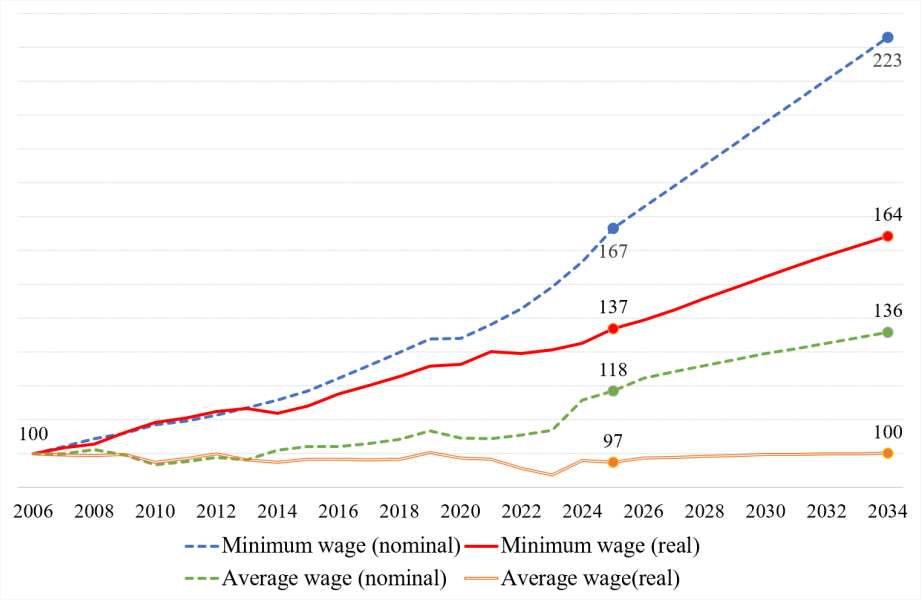
Notes: 2SLS estimation results. The standard errors clustered by prefecture are reported in parentheses. *** and ** denote $p < 0.01$ and $p < 0.05$, respectively. The trend in the dependent variable for each firm over the past three years ($\Delta y_{it-4,\,t-1}$), year-over-year change in the unemployment rate for each prefecture ($\Delta UNEMP_{pt-1,\,t}$), and year fixed effects (λ_t) are controlled.

Table 3. Estimation results: two-year interval

	(1) $\Delta WAGE_{t-1,\,t+1}$	(2) $\Delta EMP_{t-1,\,t+1}$	(3) $\Delta ROA_{t-1,\,t+1}$	(4) $\Delta LP_{t-1,\,t+1}$	(5) $\Delta TFP_{t-1,\,t+1}$
$\Delta MW_{t-1,\,t+1}$	1.210 **	-2.011 ***	-0.812 ***	1.287	0.130
	(0.401)	(0.590)	(0.207)	(1.238)	(0.917)
Observations	18,926	19,207	18,971	14,775	14,495
R^2	0.119	.	0.149	0.113	0.151
First stage					
$MWGAP_{t-1}$	-0.052 ***	-0.053 ***	-0.052 ***	-0.051 ***	-0.051 ***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)

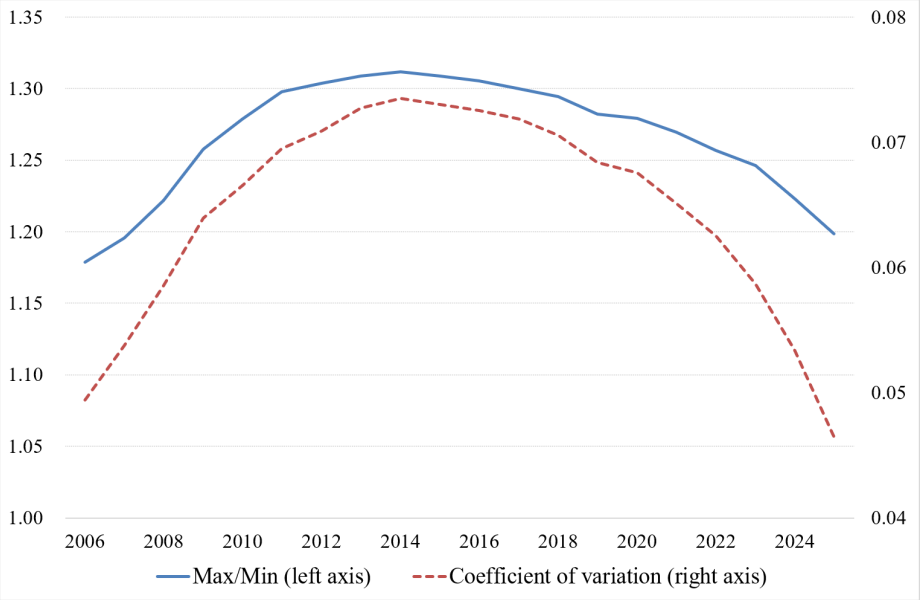
Notes: 2SLS estimation results. The standard errors clustered by prefecture are reported in parentheses. *** and ** denote $p < 0.01$ and $p < 0.05$, respectively. The trend in the dependent variable for each firm over the past three years ($\Delta y_{it-4,\,t-1}$), year-over-year change in the unemployment rate for each prefecture ($\Delta UNEMP_{pt-1,\,t}$), and year fixed effects (λ_t) are controlled.

Figure 1. Trends in minimum wages and average wages (2006 = 100)



Notes: The trajectory of the minimum wage from 2026 onward is based on the assumption that it will reach 1,500 yen in 2034. The average wage (for general workers) is projected using the wage growth rate from the baseline scenario of the Medium- to Long-Term Economic and Fiscal Projections (Cabinet Office). The minimum and average wages are converted into real terms using the consumer price inflation rate from the same projections.

Figure 2. Regional disparity in the minimum wage



Note: Coefficient of variation is calculated as the standard deviation divided by the simple average of prefectural minimum wages.

Appendix Tables

Table A1. Firms' responses to minimum wage increases

Measures	%
Raising prices	47.7
Reducing profits	38.8
Improving productivity through investments	34.5
Cutting working hours	27.5
Education and training of employees	20.3
Reducing the number of employees	7.1

Note: The percentages are calculated from a survey of Japanese firms conducted from November 2023 to January 2024. The multiple responses from firms reporting that the minimum wage increase impacted their business (N = 991) are tabulated (see Morikawa, 2024, for additional details).

Table A2. Comparison of the mean values between single- and multiple-establishment firms

	Single-establishment firms	Multiple-establishment firms	Diff.	
WAGE	0.821	0.843	-0.022	***
EMP	4.742	5.388	-0.646	***
ROA	0.047	0.049	-0.002	***
LP	1.271	1.340	-0.069	***
TFP	-0.073	-0.044	-0.029	***

Notes: *** denote $p < 0.01$. The numbers are expressed in logarithms, except for *ROA*.

Table A3. Effect of minimum wage increase on the number of standard employees

	(1) $\Delta EMP_{t-1,t}$		(2) $\Delta EMP_{t-1,t+1}$
$\Delta MW_{t-1,t}$	-2.716 ***	$\Delta MW_{t-1,t+1}$	-2.874 ***
	(0.734)		(0.715)
Observations	19,567		15,421
R^2	0.004		.
First stage			
$MWGAP_{t-1}$	-0.024 ***	$MWGAP_{t-1}$	-0.053 ***
	(0.004)		(0.009)

Notes: 2SLS estimation results. The standard errors clustered by prefecture are reported in parentheses. *** denotes p < 0.01. The trend in the dependent variable for each firm over the past three years ($\Delta y_{it-4,t-1}$), year-over-year change in the unemployment rate for each prefecture ($\Delta UNEMP_{pt-1,t}$), and year fixed effects (λ_t) are controlled. One- and two-year interval estimations are presented in columns (1) and (2), respectively.

Table A4. OLS estimation results

	(1) $\Delta WAGE_{t-1,t}$	(2) $\Delta EMP_{t-1,t}$	(3) $\Delta ROA_{t-1,t}$	(4) $\Delta LP_{t-1,t}$	(5) $\Delta TFP_{t-1,t}$
$\Delta MW_{t-1,t}$	0.960	-0.937 ***	-0.843 ***	0.900	0.407
	(0.630)	(0.295)	(0.275)	(0.928)	(1.259)
Observations	25,026	25,375	25,103	19,625	19,244
R^2	0.125	0.003	0.131	0.115	0.150

Notes: OLS estimation results. The standard errors clustered by prefecture are reported in parentheses. *** denotes p < 0.01. The trend in the dependent variable for each firm over the past three years ($\Delta y_{it-4,t-1}$), year-over-year change in the unemployment rate for each prefecture ($\Delta UNEMP_{pt-1,t}$), and year fixed effects (λ_t) are controlled.

Table A5. Estimations excluding minimum wage change in 2020

	(1) $\Delta WAGE_{t-1,\,t}$	(2) $\Delta EMP_{t-1,\,t}$	(3) $\Delta ROA_{t-1,\,t}$	(4) $\Delta LP_{t-1,\,t}$	(5) $\Delta TFP_{t-1,\,t}$
$\Delta MW_{t-1,\,t}$	0.827	-1.258 ***	-1.106 ***	-1.562	-1.738
	(0.606)	(0.293)	(0.257)	(0.962)	(1.329)
Observations	20,089	20,363	20,156	15,625	15,326
R^2	0.127	0.003	0.114	0.112	0.125
First stage					
$MWGAP_{t-1}$	-0.026 ***	-0.026 ***	-0.026 ***	-0.026 ***	-0.025 ***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)

Notes: 2SLS estimation results. The standard errors clustered by prefecture are reported in parentheses. *** denotes $p < 0.01$. The trend in the dependent variable for each firm over the past three years ($\Delta y_{it-4,\,t-1}$), year-over-year change in the unemployment rate for each prefecture ($\Delta UNEMP_{pt-1,\,t}$), and year fixed effects (λ_t) are controlled.